

Amendment Under 37 C.F.R. § 1.116
U.S. App. Ser. No. 09/986,332

Atty. Dck. No. Q66212

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1-207. (canceled).

208. (currently amended): A nitride semiconductor growth method comprising the steps of:

(a) forming a first selective growth mask on a support member made up of a dissimilar substrate made of a material different from a nitride semiconductor and having a major surface, and an underlayer made of a nitride semiconductor formed on the major surface of the dissimilar substrate having an off-angled major surface from the horizontal plane, wherein the off-angled major surface of the dissimilar substrate has an off-angle which is less than 1°, and wherein said off-angled major surface is formed stepwise such that the substrate has substantially horizontal terrace portions and stepped portions, said first selective growth mask having a plurality of first windows selectively exposing an upper surface of the underlayer of the support member;

(b) growing first nitride semiconductor portions from the upper surface portions of the underlayer which are exposed from the windows, until the first nitride semiconductor portions grown in the adjacent windows combine with each other on an upper surface of said selective growth mask;

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(c) forming a second selective growth mask on the first nitride semiconductor portions grown in the step (b), said second selective growth mask having a plurality of second windows selectively exposing upper surfaces of the first nitride semiconductor portions;

(d) growing second nitride semiconductor portions from the upper surfaces of the first nitride semiconductor portions which are exposed from the second windows, until the second nitride semiconductor portions grown in adjacent windows combine with each other on an upper surface of said second selective growth mask to form a nitride semiconductor substrate; and

(e) growing nitride semiconductor layers including an active layer over the semiconductor substrate.

209. (previously presented): A nitride semiconductor growth method according to claim 208, wherein the second selective growth mask is positioned to cover the first windows of the first selective growth mask.

210. (previously presented): A nitride semiconductor growth method according to claim 208, wherein the first nitride semiconductor portions and second nitride semiconductor portions are nitride semiconductor crystals grown laterally on the corresponding selective growth mask.

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211. (previously presented): A nitride semiconductor growth method according to claim 208, wherein the dissimilar substrate is one selected from the group consisting of a sapphire having the C plane, the R plane, or the A plane as a major surface, spinel, SiC, ZnS, GaAs, Si, ZnO, and $\text{La}_x\text{Sr}_{1-x}\text{Al}_y\text{Ta}_{1-y}\text{O}_3$.

212. (previously presented): A nitride semiconductor growth method according to claim 208, wherein the nitride semiconductor is a light-emitting diode or laser diode device.

213. (previously presented): A nitride semiconductor growth method according to claim 208, wherein said step of growing nitride semiconductor layers including said active layer over the nitride semiconductor substrate includes forming said active layer to include indium.

214. (previously presented): A nitride semiconductor growth method according to claim 208, wherein said step of growing nitride semiconductor layers including said active layer over the nitride semiconductor substrate further comprises steps of:

forming a buffer layer in contact with the nitride semiconductor substrate, the buffer layer being a distorted superlattice structure formed by alternately stacking first and second nitride semiconductor layers having different compositions.

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215. (previously presented): A nitride semiconductor growth method according to claim 208, further comprising a step of doping said nitride semiconductor substrate with an n-type impurity.

216. (previously presented): A nitride semiconductor growth method according to claim 215, wherein the n-type impurity is one element selected from the group consisting of Si, Ge, Sn, and S.

217. (currently amended): A nitride semiconductor substrate growth method comprising the steps of:

(a) forming a first selective growth mask on a support member made up of a dissimilar substrate made of a material different from a nitride semiconductor and having a major surface, and an underlayer made of a nitride semiconductor formed on the major surface of the dissimilar substrate having an off-angled major surface from the horizontal plane, wherein the off-angled major surface of the dissimilar substrate has an off angle which is less than 1°, and wherein said off-angled major surface is formed stepwise such that the substrate has substantially horizontal terrace portions and stepped portions, said first selective growth mask having a plurality of first windows selectively exposing an upper surface of the underlayer of the support member;

(b) growing first nitride semiconductor portions from the upper surface portions of the underlayer, which are exposed from the windows, until the first nitride semiconductor portions

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grown in the adjacent windows combine with each other, on an upper surface of said selective growth mask;

(c) forming a second selective growth mask on the first nitride semiconductor portion grown in the step (b), said second selective growth mask having a plurality of second windows selectively exposing upper surfaces of the first nitride semiconductor portions; and

(d) growing second nitride semiconductor portions from the upper surfaces of the first nitride semiconductor portions, which are exposed from the second windows, until the second nitride semiconductor portions grown in the adjacent windows combine with each other on an upper surface of said second selective growth mask.

218. (previously presented): A nitride semiconductor substrate growth method according to claim 217, wherein the second selective growth mask is positioned to cover the first windows of the first selective growth mask.

219. (previously presented): A nitride semiconductor substrate growth method according to claim 217, wherein the first nitride semiconductor portions and second nitride semiconductor portions are nitride semiconductor crystals grown laterally on the corresponding selective growth mask.

220. (previously presented): A nitride semiconductor substrate growth method according to claim 217, wherein the dissimilar substrate is one selected from the group

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consisting of a sapphire having the C plane, the R plane, or the A plane as a major surface, spinel, SiC, ZnS, GaAs, Si, ZnO, and $\text{La}_x\text{Sr}_{1-x}\text{Al}_y\text{Ta}_{1-y}\text{O}_3$.

221. (withdrawn): A nitride semiconductor substrate comprising:

a support member having:

a dissimilar substrate made of a material different from a nitride semiconductor and having an off-angled major surface from the horizontal plane, and

an underlayer made of a nitride semiconductor formed on the major surface of the dissimilar substrate;

a first selective growth mask formed on the support member, the first selective growth mask having a plurality of first windows selectively exposing an upper surface of the underlayer of the support member;

first nitride semiconductor portions grown from the upper surface portions of the underlayer, which are exposed from the windows on an upper surface of said selective growth mask;

a second selective growth mask formed on the first nitride semiconductor portion, the second selective growth mask having a plurality of second windows selectively exposing upper surfaces of the first nitride semiconductor portions; and

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second nitride semiconductor portions grown from the upper surfaces of the first nitride semiconductor portions, which are exposed from the second windows on an upper surface of said second selective growth mask.

222. (withdrawn): A nitride semiconductor substrate according to claim 221, wherein the second selective growth mask is positioned to cover the first windows of the first selective growth mask.

223. (withdrawn): A nitride semiconductor substrate according to claim 221, wherein the first nitride semiconductor portions and the second nitride semiconductor portions are nitride semiconductor crystals grown laterally.

224. (withdrawn): A nitride semiconductor substrate according to claim 221, wherein the dissimilar substrate is one selected from the group consisting of a sapphire having the C plane, the R plane, or the A plane as a major surface, spinel, SiC, ZnS, GaAs, Si, ZnO, and $\text{La}_x\text{Sr}_{1-x}\text{Al}_y\text{Ta}_{1-y}\text{O}_3$.

225. (withdrawn): A nitride semiconductor structure having a substrate, the substrate comprising:

a support member having:

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a dissimilar substrate made of a material different from a nitride semiconductor and having a major surface that is an off-angled major surface from the horizontal plane, and an underlayer made of a nitride semiconductor formed on the major surface of the dissimilar substrate;

a first selective growth mask formed on the support member, the first selective growth mask having a plurality of first windows selectively exposing an upper surface of the underlayer of the support member;

first nitride semiconductor portions grown from the upper surface portions of the underlayer, which are exposed from the windows on an upper surface of said selective growth mask;

a second selective growth mask formed on the first nitride semiconductor portion, the second selective growth mask having a plurality of second windows selectively exposing upper surfaces of the first nitride semiconductor portions; and

second nitride semiconductor portions grown from the upper surfaces of the first nitride semiconductor portions, which are exposed from the second windows on an upper surface of said second selective growth mask.

226. (withdrawn): A nitride semiconductor structure according to claim 225, wherein the second selective growth mask is positioned to cover the first windows of the first selective growth mask.

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227. (withdrawn): A nitride semiconductor structure according to claim 225, wherein the first nitride semiconductor portions and second nitride semiconductor portions are nitride semiconductor crystals grown laterally.

228. (withdrawn): A nitride semiconductor structure according to claim 225, wherein the dissimilar substrate is one selected from the group consisting of a sapphire having the C plane, the R plane, or the A plane as a major surface, spinel, SiC, ZnS, GaAs, Si, ZnO, and $\text{La}_x\text{Sr}_{1-x}\text{Al}_y\text{Ta}_{1-y}\text{O}_3$.

229. (withdrawn): A nitride semiconductor structure according to claim 225, wherein said nitride semiconductor structure is a light-emitting diode or laser diode device.

230. (withdrawn): A nitride semiconductor structure according to claim 225, further comprising an active layer containing indium.

231. (withdrawn): A nitride semiconductor structure according to claim 225, wherein said second nitride semiconductor portions form a nitride semiconductor substrate, said nitride semiconductor structure further comprising a buffer layer in contact with the nitride semiconductor substrate, wherein the buffer layer is a distorted superlattice structure of alternately stacked first and second nitride semiconductor layers having different compositions.

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232. (withdrawn): A nitride semiconductor according to claim 225, wherein said second nitride semiconductor portions form a nitride semiconductor substrate, and wherein the nitride semiconductor substrate is doped with an n-type impurity.

233. (withdrawn): A nitride semiconductor substrate according to claim 232, wherein the n-type impurity is one element selected from the group consisting of Si, Ge, Sn, and S.

234. (canceled).

235. (previously presented): A method according to claim 208, wherein the off-angled major surface forms C plane.

236. (canceled).

237. (canceled).

238. (previously presented): A method according to claim 217, wherein the off-angled major surface forms C plane.

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239. (canceled).

240. (new): A method according to claim 208, wherein the off-angle with respect to the major surface of the dissimilar substrate is 0.6° or less.

241. (new): A method according to claim 208, wherein the dissimilar substrate is a sapphire substrate having a C plane as a major surface.

242. (new): A method according to claim 208, wherein each of the terrace portions being adjusted to 0.5 angstroms to 2 angstroms, each of the stepped portions being adjusted to 2 angstroms to 30 angstroms.

243. (new): A method according to claim 217, wherein the off-angle with respect to the major surface of the dissimilar substrate is 0.6° or less.

244. (new): A method according to claim 217, wherein the dissimilar substrate is a sapphire substrate having a C plane as a major surface.

245. (new): A method according to claim 217, wherein each of the terrace portions being adjusted to 0.5 angstroms to 2 angstroms, each of the stepped portions being adjusted to 2 angstroms to 30 angstroms.

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246. (new): A method according to claim 208, wherein the stepped portions are substantially lateral to the substantially horizontal terrace portions and wherein the off-angle is the angle defined by a straight line connecting a bottom portion of a plurality of stepped portions and the horizontal plane of the uppermost terrace portions of the dissimilar substrate.

247. (new): A method according to claim 217, wherein the stepped portions are substantially lateral to the substantially horizontal terrace portions and wherein the off-angle is the angle defined by a straight line connecting a bottom portion of a plurality of stepped portions and the horizontal plane of the uppermost terrace portions of the dissimilar substrate.